I 5231.B31

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY

FOREST INSECT INVESTIGATIONS

HISTORY OF YELLOWSTONE PARK BARKBEETLE CONTROL PROJECT

by
James C. Evenden
Entomologist

Forest Insect Field Station
Coeur d'Alene, Idaho
October 29, 1931

U. S. GOVERNMENT PRINTING OFFICE: 1929 J 76133

(Mr. Koch says to leave this loose in front of "History of Yellowstone Park Bark Beetle Control Project - Oct. 29, 1931)

REPORT OF THE SURVEY OF THE GALLATIN NATIONAL FOREST TO DETERMINE THE STATUS OF THE MOUNTAIN PINE BEETLE - 1931

The object of the 1931 barkbeetle survey on the Gallatin Forest was to determine the status of the mountain pine beetle on the Forest. An extensive survey was to be made of the Forest unless areas showing a concentration of beetle work were discovered, in which case a sufficiently intensive survey was to be made to secure an indication of the infestation present.

The survey indicates that the infestation over most of the Forest is quite light, averaging for the entire area less than .02 trees per acre. Concentration of attack was noted on a few areas, and the data for them has been arranged in Table I. Designations of areas are by township and range. A more intensive survey of these areas was desirable, but impossible under the prevailing weather conditions and the short time available.

Park Ranger Johnston found considerable mountain pine beetle infestation in the north and northwestern part of the Yellowstone Park. On the basis of his verbal report, a more intensive survey was made of the areas adjoining the Park on the north and west. Both the Yellowstone Park and the present survey found the greatest infestation in the white bark pine type and only a very light infestation in general in lodgepole pine. The infestation in white bark pine is not a new one, the numerous red-tops indicating it has been active for a number of years, although not killing annually as many trees as during the present season.

A peculiarity of the infestation is that even in the mixed lodgepole - white bark pine type the mountain pine beetle seems to prefer white bark pine, and with one exception no really active centers of attack on lodgepole pine were noted. The one exception was around the fire line and in the zone of damage by the Placer Creek fire, where scorched lodgepole pine and white bark pine both contain mountain pine beetle brood. Small groups of attacked lodgepole pine were also noted within a radius of a mile of the fire.

For the entire forest a total of about 580 miles of strip one chain broad indicates about 16,000 attacked trees, based on an average of .019 trees per acre. Of the 240 attacked trees noted, 105 were lodgepole pine and 135 white bark pine. Of the total strip obtained, about 300 miles were run in lodgepole pine type and about 70 in white bark pine. This ratio of types does not indicate the ratio present on the forest. There is probably a larger ratio of white bark pine but much of it is inaccessible at this time of the year.

In T. 11 S., R. 5 E., a heavy infestation, probably of the Engelmann spruce beetle, is present in Engelmann spruce. On 106.9 acres, 83 attacked spruce were observed, giving an average of .776 trees per acre.

Destruction of scattered lodgepole pine by the lodgepole pine beetle is general over the entire forest, but in no place is the damage heavy.

A map of the area, showing the plotted strips of the survey, accompanies this report. The original data and summary sheets are also enclosed.

Respectfully submitted,

/s/ Archie L. Gibson

Assistant Entomologist

HISTORY OF YELLOWSTONE PARK

BARKBEETLE CONTROL PROJECT

INTRODUCTION

This memorandum has been prepared for the purpose of presenting to all interested agencies in attendance at the Denver Insect Control Conference, called for the evening of November 2nd, 1931, a brief history of the "Yellowstone Park Barkbeetle Control Project." It is believed that from such a history the seriousness of the present situation, as well as the difficulties of control, can be more fully visualized. As all steps in the history of this project, which started in 1926, are covered by individual reports, tedious details have been omitted from this paper and only a brief discussion relative to the progress of the infestation and the work which has been done to combat it are included. It is trusted that in this desire for brevity essential facts have not been omitted.

Perhaps a word of explanation as to the writer's selection of the title "Yellowstone Park Barkbeetle Control Project" is necessary. Though in the past all steps of this project which started in 1926 have been considered under local names, it would seem best at this time, inasmuch as the protection of the scenic value of the Yellowstone is their primary objective, to consider them under the one title as given.

Statements have been made in past reports, and of a necessity repeated in this paper, relative to the flight habits of the mountain pine beetle. It is recognized that the position which the Bureau of Entomology has taken on this matter is, and always will be, a difficult one to prove. The workers

of the Bureau have satisfied themselves, to a point where they sincerely believe that a shadow of a doubt no longer exists, that some epidemics of the mountain pine beetle in lodgepole have spread over large areas as a result of both long and short flights. Forecasts as to the spread of an outbreak can not be made, nor can it be said as to how far or in what direction the insects from a definite area will fly if a flight occurs. It is known, however, that mountain pine beetle outbreaks which are allowed to develop into heavy blocks of infestation constitute a serious potential menace to timber stands not only immediately adjacent but some distance removed. The position which the Bureau of Entomology advances on this matter of insect flight is not a mere theory. It is based upon the study of existing epidemics over a period of years. Data from these studies, together with many observations of existing conditions, clearly demonstrate to all those familiar with the situation the soundness of the principle. This matter, somewhat apart from the history of this project, has been mentioned, as the following analysis of past situations, as well as the future success of the Yellowstone project, depends entirely upon the flight habits of the insects concerned.

EARLY HISTORY

Late in 1911 an outbreak of the mountain pine beetle in the Big Hole Basin was brought to the attention of the Forest Service. During the seasons of 1912 and 1913, some 25,000 trees were treated. This work was apparently very successful, for from that time until 1926 no further records of losses were recorded. Furthermore, when work was resumed within this same area in 1926, to check the spreading Bitterroot outbreak, there were

no indications of depredation following the 1913 project.

Prior to this time an outbreak of the same insect in the white pine and lodgepole pine stands of the Flathead National Forest was reported in 1909. In 1912, control work was instituted and some 20,000 infested trees were treated at Swan Lake. However, it is apparent that this outbreak was far more widespread than was assumed by those in charge, and that the control operation was confined to a small area. In attempting to analyze this situation it would seem that the control work was confined to the heavy centers and that the outlying groups were allowed to spread southward across the rather lower divide between the Flathead and the Missoula National Forests. The devastation and fire hazard created by this outbreak within the northern portion of the Missoula is still mute evidence of its seriousness. With the advent of this infestation into the northern portion of the Missoula National Forest, it was, in a measure, officially forgotten, as the life and potential spread of such an outbreak was not foreseen.

MORE MODERN HISTORY

During the winter of 1924 it became known to the Regional Office that there were a number of lodgepole pine trees being killed by the mountain pine beetle in the southern portion of the Missoula National Forest in the vicinity of Philipsburg. This area, though over one hundred miles to the south of where control work was instituted at Swan Lake in 1912, could be connected through successive steps of the epidemic. As vast timber stands of aesthetic and commercial values lay directly in the southern path of the Philipsburg infestation, the situation was considered as justifying action. Without the advantage of any survey, this infestation was considered as constituting the

head of the spreading infestation from the north. The Philipsburg basin was adopted as a "No bug's land," and plans formulated to treat all of the infested trees to the south of this area. In late May and June, 1924, with the few hundred dollars available, 1010 trees were treated by a small mobile crew.

In the summer of 1924, an extensive survey was made of not only that portion of the Missoula Forest covered by control, but of the adjacent portions of the Bitterroot, Beaverhead, and Deerlodge Forests. The results of this survey were more than discouraging, as it was found that not only had areas been missed by the feeble control of the previous spring, but that on the head of the east fork of the Bitterroot River there were heavy centers of infestations, with thousands of trees harboring the 1925 attacks of the mountain pine beetle. As at that time barkbeetle control was not considered in the same magnitude as at this time, thoughts of continuing the project were abandoned, though its seriousness was not underestimated.

Late in the winter of 1924 and 1925, a few thousand dollars available from the insect control allotment were offered to Region One, to combat the existing Bitterroot infestation. These moneys were accepted, and in a hastily conceived plan of control all infested trees to the south of an imaginary line, consisting of small streams, drainages, and divides, were treated, with no recognition of the ability of these insects to fly even short distances. The following summer the inevitable occurred, and with a hop, skip, and a short jump, the beetles spread across this line of defense, infesting ten trees where one had been previously treated.

A survey conducted during the summer of 1925 showed that there were now some rather large groups of 1925 attacks on the west side of the Big

Hole Basin, where in 1924 there were only a very few small spots of infestation. With a still further attempt to check the spread of this outbreak into the Beaverhead Forest and areas to the south, plans were instituted for the treatment of the infested trees within the Big Hole Basin in the spring of 1926. Another attempt was also made at that time to check the infestation on the east fork of the Bitterroot River from spreading into the valuable yellow pine stands of the west fork. Though some hope was held out for the holding of the Big Hole Basin, with the expectation that the Continental Divide would act as a partial barrier to the spread of the insects, very little chances of success were offered for the Bitterroot campaign.

A more intensive survey conducted during the summer of 1926 showed the fallacy of continuing the Bitterroot project, and also demonstrated that there had been a heavy flight of beetles across the Continental Divide, reinfesting the areas within the Big Hole Basin which had been thoroughly covered by control the previous spring. In the execution of the 1925 survey the writer overlooked, or rather underestimated, the flight potentials of these insects, for not only did they cross the divide into the treated portions of the west side of the basin, but small spots of infestation crossed the timberless areas and became established on the east side of the Basin. The possibilities of such an occurrence were not entirely overlooked, but the survey of the east side consisted of a red top reconnaissance only, and of course the new attacks (1926) did not show at that time.

Still hoping that the Big Hole Basin might be held against the spread from the Bitterroot, a much larger area on the west side of the

Big Hole Basin was once more thoroughly covered by control in 1927. Again the results of the fall survey were discouraging. Not only were the areas thoroughly covered by control reinfested to a degree heavier than that treated, but all portions of the Big Hole Basin now contained heavy infestations.

At this time a new element of danger was recognized, and must be recorded in this history. With its source an item of conjecture, an outbreak of the mountain pine beetle in the lodgepole pine forest of the Salmon National Forest reached in 1927 a serious epidemic status. This outbreak caused the existing Big Hole project to be viewed in a more precarious light. The Salmon Forest borders the Beaverhead Forest, and large blocks of infestation just over the Continental Divide from the Big Hole Basin were considered as constituting a new source of reinfestation to the areas being covered by control. In fact, it was sincerely believed that these centers of infestation on the Salmon had already contributed to the scattered infestation which occurred in the southern portion of the Big Hole Basin in 1927.

In considering the devastation that would occur to both commercial and scenic properties if this epidemic continued its southern spread, control work was again instituted in 1928, on the largest scale ever before undertaken, in a rather forlorn hope that the Big Hole Basin might be held. However, the reinfestation which occurred during the summer of 1928 within the areas previously covered by control clearly demonstrated the folly of attempting to continue this project in its present form, and no further work was recommended for the Big Hole Basin. In explanation of this position the following

is offered. In 1928, there were 60,000 acres covered by control, with an expenditure of $69,000. The 1928 reinfestation of this area alone was so severe that to have treated this same acreage in 1929 at least $350,000 would have been required, and it was shown by the survey that there were some 500,000 additional acres that were lightly infested but which would need be considered in all future plans of control. Because of the physical and financial difficulties of such a project, as well as the fact that no hope of success could any longer be held, the present project was discontinued. However, in full recognition of the seriousness of the situation, every effort was to be made to prevent the insects from becoming established within the Madison Forest, which was separated from the Beaverhead with some rather wide timberless areas.

At this time the writer desires to break briefly into the discussion of the history of this project to mention the value of adequate surveys following all control projects. The Big Hole survey of 1928 was the first time that a worth while reconnaissance had been made of this project, and its worth has been proven many times over. Without the data secured from this survey it is possible that the project might have been continued, and that large sums of money might have been foolishly spent in attempting to stem the spread of the Bitterroot and Salmon infestations into the Big Hole Basin, while the insects had already crossed the so called barrier and were established miles away. The institution of a project without complete information as to the status of the infestation within adjacent areas, though sometimes necessary because of the time element often involved, should always be avoided when possible. But the continuation of a project without these data can not be justified on any grounds, and inevitably leads to useless expenditure of public funds.

Nothing more was done with the Beaverhead infestation until during the summer of 1930 small spots of infested trees were discovered scattered throughout the western portion of the Madison National Forest. At the same time the annual survey of the Beaverhead National Forest which is now being conducted by the Bureau of Entomology disclosed the fact that the timbered area known as the Sheep Creek Canyon, lying between the Beaverhead and Madison Forests, was rather heavily infested. In the spring of 1931 control measures were instituted, and all of the infested areas within the Madison as well as the Sheep Creek Canyon were thoroughly treated. This brings the discussion of the Montana portion of this project up to the 1931 survey, which will be handled under the "Present Status of the Infestation."

At this time it is necessary to go back to the year 1928, for in that year infestations of the mountain pine beetle were discovered within the Targhee National Forest. This Forest borders the Yellowstone Park to the southwest, and the infestation constituted a serious potential menace to the scenic timber stands of the Yellowstone. The known infestations within the Targhee were treated in the spring of 1930, but a survey conducted during the following summer showed that the outbreak was far more widespread than had been anticipated, and was also present within the Teton, Caribou, Wyoming and Cache Forests. In the spring of 1929, control work was extended to these Forests, and again all known infested areas were covered by control. During the following summer a survey of these Forests again disclosed the fact that, with the exception of the Targhee, where the number 30,000 remained about the same, there had been a marked increase in the number of infested trees. New areas of infestation were also uncovered by this survey. Control work was again conducted on these Forests in 1930, and followed by

surveys during the summer. Some success was attained by this work, and substantial reduction in the amount of reinfestation on the Targhee, Teton, and Cache were shown by the surveys, but marked increases in the Wyoming and Caribou. A few new areas of infestation were also discovered by the 1930 survey and fall control work. Late in the fall it was found that infestation was then present in the southwest corner of the Park, and plans were made to treat the infested trees the following spring.

In 1931, these Forests, as well as the known infested areas of the Yellowstone, were once more covered by control, and every effort made to make the work as thorough and effective as possible. Thorough clean-ups were called for, and stress placed upon the importance of locating and treating all infested trees.

It would seem that a brief discussion of the infestation existing in the Targhee, Teton, Wyoming, Caribou and Cache National Forests might be of interest, and would serve to more clearly depict the present situation. The inception of this rather widespread outbreak, which was first recorded in 1928, is unknown. Infestations develop locally, and it is possible, and very likely probable, that the outbreak on these five Forests developed from existing normal or endemic infestations. With our present realization of flight potentials of insects when carried by strong air currents, a flight of beetles from the more heavily infested areas to the northwest is perhaps not an impossibility. The fact that these outbreaks occurred as a rather progressive step in the Montana epidemic and even the Salmon Forest outbreak might lend some argument to the flight possibility. The writer has no definite opinions on this matter aside from the fact that both solutions are possible, with the greater emphasis being placed upon the first. It is

a matter which can never be definitely proven so need not be discussed further at this time. However, regardless of the source of the reinfestation which has occurred on the treated areas it is a problem which has a direct bearing upon the future of this project and must be seriously considered. The writer desires to quote from his report of the Targhee project for the season of 1930:

"It is obvious that there are but two ways to account for this unexpected reinfestation that has occurred within the areas covered by control. Either there was sufficient bark surface left untreated within these areas to account for the 1930 infestation, or else insects are flying into the areas. Such untreated bark surface could have existed in trees missed during the operation and through the inadequate treatment of infested trees. In considering the possibilities of missed trees, thought must be given to the one sided attack of trees where a normal brood is produced from the sided attack, but the uninfested side passed by the spotter and the tree considered as being uninfested. Flights of insects would of necessity be coming from the severe epidemics of this insect within the Forests to the north, or else from the untreated areas adjacent to the control units."

The writer can see no reason to change this analysis. It is a mooted question, one that has entered seriously into the problem, and one which to a large extent will measure the success of our efforts to protect the Forests of the Yellowstone. To try and throw more light upon this question, the 1931 control operations were instituted on the basis of a 100 per cent clean-up. Through the adoption of such a policy it was thought that if the treated areas again showed a heavy 1931 reinfestation one would of

a necessity feel that insects were flying into the area. From the results of the 1931 survey it is hoped that a more definite position can be taken on this rather vital issue.

This discussion brings the history of the "Yellowstone Park Bark-beetle Project" up to the situation as exists in the fall of 1931. It is doubted if all of the necessary data will be available to the writer in time to include the present status of the infestation within this paper. However, in the following tabulation, which shows in a trifle more detail the steps mentioned in this history, all 1931 data available will be included:

TABULATED FINANCIAL HISTORY OF PROJECT

Early Work Perhaps not a part of Project

- - - - - -

Swan Lake Project - Flathead National Forest

Year	Acreage	Trees Treated	Cost per Tree	Total Cost	Remarks
1913	3,240	28,000	$ 0.22	$6,350	Trees were felled in windrows and burned. Apparently only large groups. No spotting cost, etc.

Big Hole Basin - Beaverhead National Forest

1912	10,000	2,426	0.72	1,750	Trees treated standing. Lower 6-12 feet peeled. No spotting charges.
1913	60,000	23,393	.33	7,789	" " " "

Late Work - Part of Yellowstone Park Project
Bitterroot National Forest

1925	8,960	7,725	.87	6,735	Trees treated standing. Lower 6-12 feet of bole peeled. No spotting charges
1926	7,000	1,284	3.89	4,832	Trees felled and peeled.

Big Hole Basin - Beaverhead National Forest

1926	17,920	5,271	2.27	11,984	Trees felled. Infested portion of bole placed in decks and burned. 100% spotting
1927	18,588	17,418	1.80	31,500	" " " "
1928	299,520	55,045	1.62	89,289	" " " "

Targhee National Forest

Year	Acreage	Trees Treated	Cost per Tree	Total Cost	Remarks
1928	5,000	2,752	.64	$ 1,766.00	Trees burned standing by spraying oil on bole
1929	14,800	31,204	.53	16,469.34	Same method. Better job of burning; more oil used. Comb. spotting and treating crews
1930	67,948	30,064	.95	28,449.00	Same method. More oil used and larger area covered. Scattered infestation.
1931	102.870	Fall 1930-3,671: Spring 1931-32-316	1.31	42.517.77	Fall control. Spring control 18% Felled for treatment
Estimated 1932	438.000	119.874	1.31 ?	157.000 ?	

Teton National Forest

1929		651			Trees burned standing with oil
1930	4,000	4,515	.68	3,062	
1931	4,500	4,762	1.41	6,717	38 per cent of trees felled for treatment. 62 per cent burned standing.
Estimated 1932		1,400		4,601	

Wyoming National Forest

1929		6,945	.69	4,834	Trees burned standing with oil. Some felled for treatment.
1930	60,800	17,160	1.37	23,509	Trees burned standing with oil. A few felled.
1931	105,000	17,055	3.37	57,645	Rather a large per cent of trees felled for treatment. Remainder burned standing.
Estimated 1932	48.339	11.993		44.510	

Caribou National Forest

Year	Acreage	Trees Treated	Cost per Tree	Total Cost	Remarks
1929		386			
1930	3,240	1514-Fall 1929 3049-Spring 1930	$ .98	$ 2,981.00	No cost figures available for trees treated fall of 1929.
1931	14.980	15,539		16,558	
Estimated 1932	24,000	11,241		21,000	

Cache National Forest

1929		7,906	.34	2,699.00	
1930	23,250	17,158	.54	9,234.00	
1931	34,000	9,150	.801	7,332.00	
Estimated 1932	84,955	3,837	1.44	6,394.00	$1000 for fall control 1931 - 586 trees treated

Beaverhead (Madison) National Forest

1931	23,000	5,870	3.91	22,976.00	
Estimated 1932	15,104	32,030		65,000	

Yellowstone National Park

1931	12,344	2,888	2.69	7,767.00	Burned standing & Felled and Burned
Estimated 1932	117,826	43,999	2.50	110,000.00	Estimate only

SUMMARY OF YELLOWSTONE PARK PROJECT

Forest	1929			1930			1931			1932		
	Acres	Trees	Funds	Acres	Trees	Funds	Acres	Trees	Funds	Acres	Trees	Funds
Beaverhead							16,234	5,870	22,976	15,104	32,030	65,000
Gallatin										35,840	6,557	14,354
Yellowstone							12,344	2,888	7,767	117,826	43,999	110,000
Targhee	14,800	31,204	16,469	67,948	30,064	28,449	102,670	32,316	42,571	438,000	119,874	165,000
Teton		651		4,000	4,515	3,062	4,500	4,762	6,717		1,400	4,601
Wyoming		6,945	4,834	60,800	17,160	23,509	105,000	17,055	57,645	48,339	11,993	44,510
Caribou		386		3,240	4,593	2,981	14,980	11,539	16,558	24,000	11,241	21,000
Cache		7,906	2,699	23,250	17,158	9,234	34,000	9,150	7,332	84,955	4,423	6,394
Totals		47,092	24,006		73,490	67,235		83,580	161,566		231,487	430,841

RUBY & WEST FORK MADISON UNITS

Area	Acreage Covered by Control 1931	Infested Trees Treated 1931	1931 Survey			
			Sub Units	Infested Trees	Control Recommended	Fund Required
Ruby Unit	1,245	402 L.P.P.	1	0	---	
West Fork Madison Unit	1,424	380 L.P.P. 217 W.B.P.	2	1,500	300 trees Yes	$700
			3	60	Yes	120
			4	20	Yes	60
			5	300	Yes	600
			6	200	Yes	400
	2,669	999		2,080		$1,880

GALLATIN FOREST 1931 INFESTATION

MOUNTAIN PINE BEETLE

Area	Acres	1931 Infestation Per Acre L.P.P.	W.B.P.	Total 1931 Infestation L.P.P.	W.B.P.	Total	Funds Required for 1932 Control	Cost Per Tree
Monument Mt.								
T. 10 S., R. 5 E.	10,240		.174		1782	1782	$ 4,009	$2.25
Tepee Creek								
T. 11 S., R. 4 & 5 E.	10,240	.066	.127	676	1300	1976	4,446	2.25
Denny Creek								
T. 13 S., R. 4 E.	3,200	.007	.136	22	435	457	1,028	2.25
Beaver Creek								
T. 10 S., R. 3 E.	6,400	.007	.160	46	1022	1068	2,403	2.25
Moose Creek								
T. 10 S., R. 2 E.	640		.850		544	544	1,224	2.25
Placer Creek								
T. 4 & 5 S., R. 2 E.	2,560	.105		269		469*	703	1.50
Mill Creek								
T. 9 S., R. 7 E.	2,560	.142		361		361	541	1.50
				1374	5083	6657	$14,354	

* Includes 200 fire scorched trees around Placer Creek fire.

(Mr. Keen says to have these loose in front of "History of Yellowstone Park Bark Beetle Control Project" Oct. 29, 1931)

SHEEP CANYON AND BLACKTAIL CREEK UNITS
BEAVERHEAD NATIONAL FOREST

Area	Acreage Covered by 1931 Control	Infested Trees Treated 1930	Acreage Covered	Acres of Strip	Infested Trees on Strip	1931 Survey Infested Trees Per Acre	Total Infested Trees	Funds for 1932 Control
Sheep Canyon	2,345	2764 L.P.P. 341 W.B.P. 3105	15,360	590	889	1.51	23,183	
West Fork Black Tail Creek	1,700	70 L.P.P. 288 W.B.P. 358	21,760	817	120	.147	3,200	
Middle Fork Black Tail Creek	830	48 L.P.P. 148 W.B.P. 196	7,040	165	8	.048	350	
East Fork Black Tail Creek	645	31 L.P.P. 176 W.B.P. 207	21,440	524	50	.095	2,050	
Clover-Wolverine West and Middle Creeks	6,915	700 L.P.P. 347 W.B.P. 1047	7,680	224	40	.178	1,375	

Per cent of each area covered by survey varies from 2.3% to 3.8%. The large acreage surveyed is explained as follows: The timber stands within these units lie in small scattered patches of unknown acreage. In the execution of this survey it was necessary to block all of these patches into a unit of a known acreage, which in turn was covered by the survey. As a result, the data as given show not only a very light infestation scattered over a large acreage but a marked difference in the size of the areas covered by control and those surveyed. These data are very misleading, as in reality the infestation is confined to practically the same acreage as treated last spring, with a much heavier infestation than indicated. It is regretted that the above data do not separate the two tree species attacked.